MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2019/2020

ECE3156 – SOFTWARE ENGINEERING

(EE, CE)

25 OCTOBER 2019
09:00 A.M – 11:00 A.M
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of 7 printed pages only (including this page).
2. This is a closed book exam.
3. There are **FOUR (4) QUESTIONS** in this paper. **Answer ALL questions.** All questions carry equal marks (25 marks) and the distribution of the marks for each question is given.
4. Write your answers in the Answer Booklet provided.
5. State all assumptions clearly.

Question 1

Table Q1 describes the activity network information of a particular software engineering organization for a project that they are working on.

TableQ1: Activity network information.

Activity	Description	Preceding Activity	Activity Time (days)
A	Requirements gathering	—	3
B	Project plan	A	7
C	Design plan	A	23
D	Resource plan	A	11
E	Quality Assurance plan	A, B	4
F	Test plan	B, C	9
G	Design and Test approval	B, C, E	5
H	Development	D, G	40
I	Testing & Rework	F, H	23

(a) By using the information in Table Q1, draw a network diagram for the listed activities using Activity on Node (AON) method.

[4 marks]

(b) Redraw the network diagram based on the information in Table Q1 using the Activity on Arrow (AOA) method.

[6 marks]

(c) With reference to part (b), compute any slack time that exists in the individual activities.

i. You need not redraw the AOA diagram. Instead, draw the necessary Earliest Start Time (EST) and Latest Finish Time (LFT) boxes on the current AOA diagram of part (b).

ii. Compute the Available Time (AT) for each activity followed with the float/slack time, if any.

[8 marks]

(d) With reference to part (b) and part (c), identify all of the possible critical paths for this project.

[2 marks]

(e) Draw the corresponding Gantt chart for the activities of this project based on a waterfall cycle.

[4 marks]

(f) Compute the durations (in days) of this project.

[1 mark]

Continued...

Question 2

(a) Explain what is meant by black box validation testing in software engineering.

[2 marks]

(b) Briefly explain the two types of validation tests, alpha test and beta test in software engineering.

[6 marks]

(c)

```
LN1:  insertion_procedure (int a[], int p [], int N)
LN2:  {
LN3:        int i,j,k;
LN4:        for (i=0; i<=N; i++)
LN5:        p[i] = i;
LN6:        for (i=2; i<=N; i++);
LN7:              {
LN8:              k = p[i]; j = 1;
LN9:              while (a[p[j-1]] > a[k])
LN10:             {p[j] = p[j-1];
LN11:              j--}
LN12:             p[j] = k;
LN13:             }
LN14: }
```

Figure Q2: Code snippet.

Figure Q2 shows a language code excerpt for a particular function in a program. Construct a flowgraph to illustrate the control structures in this function.

[9 marks]

(d) From part (c), calculate the cyclometric complexity of the flowgraph drawn using the node/edge calculation technique.

[2 marks]

(e) Using the value calculated in part (d), list down all the possible paths that should be tested to ensure complete control structure testing.

[2 marks]

(f) Briefly describe the difference between stress testing and performance testing.

[4 marks]

Continued...

Question 3

(a) List the five (5) components of a design model.

[5 marks]

(b) A software organization is required to develop a prepaid and postpaid Cloud Payment System (CPS) for a retail petrol stations. A system administrator, registered users and a maintenance developer will use this system once it is fully deployed. Description of this software system is as follows:

- The systems administrator is able to view all of the users' petrol usage records.
- Each registered user can only view his/her petrol utilization record.
- The systems administrator can verify new users and remove existing users from this system.
- Each registered user can request to be added into or removed from this system.
- Each registered user is able to perform monthly bill payments.
- The system administrator is able to generate a summary of payments made by all registered users on a monthly basis.
- The maintenance developer is able to access usage logs of the CPS software for debugging purposes, if necessary.

Draw a **UML use case diagram** for this system. You might have to make a few assumptions about the manner, in which a user interacts with this system.

[8 marks]

(c) The following scenario is described:

Computerized School Enrolment Management System

- The Private School is currently accepting new students.
- The School provides enrolment into several units (e.g., Primary, Secondary and Kindergarten) and advertises these division openings through the online media and social media.
- Interested students can enrol into a School units, and when the number of enrolments per unit achieves its target, the School contacts the student to confirm their enrolment. A student can only enrol into one School unit.
- The School then allocates classes to the student based on unit and assigns unit teachers to conduct preliminary assessment and training.
- Each unit can have many classes and each class is assign only to one unit.
- Each unit can have many teachers and each teacher teaches one unit only.
- After the preliminary assessment and training, students' performances are updated for further assessment.

Continued...

The School would like to computerize the major operations as described above.

i. List three (3) major entities of this scenario above. For each entity, specify at least one useful attribute. (*Note:* Use a Table to list the entities and corresponding attributes.)

[3 marks]

ii. Draw the Entity-Relationship Diagram (ERD) based on the information given using the Chen model. Specify the connectivities. However, there is no need to specify the cardinalities.

[9 marks]

Continued...

Question 4

(a) State the five steps in Object-Oriented Analysis.

[5 marks]

(b) Consider the ***air transportation system***, as follows:

- Many flights land and depart from city's airport.
- Some of the big cities may have more than one airport.
- Every flight belongs to specific airline.
- The planes may have many flights to different airports.
- Each plane is identified with serial number and model. E.g. hypersonic.
- There are specific pilots for each airline and they fly many flights.
- Each flight is identified by flight number and the date on which the flight is scheduled.
- The passenger reserves a seat for a flight.
- The seat is identified by a location.

Prepare a Unified Modelling Language (UML) **class diagram** for the *air transportation system* description above.

[14 marks]

Continued...

(c) Consider the following temperature and humidity analysis method in a Hygrometer (i.e., function):

This method opens a log (i.e., text) file and reads the pre-recorded temperature (in Celsius) and humidity values (in percentage) in this file. The temperature and humidity values are stored in a row format (i.e., one row contains a pair of temperature and humidity values). There is no restriction on the number of rows in the log file.

For each row of temperature value read, the method then converts the unit of measurement from Celsius to Fahrenheit.

If the computed temperature (in Fahrenheit) falls within the range of 100 and 212 °F and if the humidity exceeds 65%, this method increases a counter (which is initialized to zero). If the counter exceeds 80, this method prints out a warning message, closes the log file and exits immediately.

Otherwise, the method continues to read the following temperature and humidity values in the log file, and repeats the temperature conversion, range and counter check until the last element of the log file is read, after which this method closes the log file and exits.

Based on the description above, draw a flow chart of this method. Apply the necessary common flowchart shapes and symbols.

Note: $T_{(°F)} = T_{(°C)} \times 9/5 + 32$

[6 marks]

End of Paper